Varying Visual Imagery Perspective to Assess Interest

THESIS

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Introduction

Personal interests play a large role in individuals' identities and self-concepts (Emmons, 1999). Further, discovering and developing one's personal interests is crucial to well-being, as our interests are a guiding force in career choice, friendship formation, and more (Silvia, 2001). But how do we discover our personal interests in the first place? Current theories suggest that personal interests develop as a person learns that a certain subject or activity reliably evokes a phenomenological experience of feeling interested (Silvia, 2001). For instance, imagine a student, Rachel, taking a chemistry class for the first time and experiencing a sense of engagement and interest. If she takes more chemistry classes that elicit these same feelings, she will be able to link her experiences together and predict that chemistry will be interesting to her again in the future. Over time, as her expectations are fulfilled, she may develop the belief that she has a personal interest in chemistry.

Although this process may seem relatively straightforward, numerous biases could cause people to inaccurately process their experiences and fail to develop personal interests that are in line with their phenomenological experiences (Ross, 1989). For instance, cultural stereotypes hold that men are more interested in math and science subjects, such as chemistry, whereas women are more interested in language and arts (e.g. Chatard et al., 2007). If Rachel endorses this belief system as well, it may bias her to remember feeling less interested in her chemistry class than she actually was, thereby preventing her from developing a personal interest in chemistry. Thus, in order to develop personal interests that align with one's phenomenological experiences, it is critically important that when processing events, people are attuned to their actual experience and not biased by previously-held (potentially harmful) beliefs, biases, or stereotypes.

Thus, if we can attune people to actual experience while also reducing or blocking the impact of biasing beliefs when thinking about their interest in some task or activity, we can more effectively ensure the development of personal interests based on actual experience. In the current experiment, we sought to do just that by manipulating the way people construed a past activity to focus them more on their actual concrete experience than on their abstract conceptual beliefs. To do this, we manipulated an inherent feature of the mental imagery -its visual perspective- that people commonly use when recalling past events in their lives.

Visual Imagery Perspective

When recalling past events, people often use mental imagery to simulate events by forming a mental image of the scene in their "mind's eye" (Moulton & Kosslyn, 2011). Interestingly, people do not always visualize events through their own first-person visual perspective, looking out at their surroundings as they actually experienced the event; people sometimes instead take a third-person visual perspective, imagining the event from an observer's vantage point to see the self as well as the surroundings (Nigro & Neisser, 1983). Further, not

only are people able to choose which visual-perspective to use when visualizing events, but the visual-perspective used changes how the event is processed (Libby & Eibach, 2011). The first-person perspective invokes an experiential processing style, causing people to understand the event in terms of their phenomenological reactions to the pictured scene. In contrast, the third-person perspective invokes a conceptual processing style, causing people to understand the event in relation to its broader context and their pre-existing belief systems.

By invoking two distinct processing styles, imagery perspective influences how individuals process and interpret (Libby & Eibach, 2011). Any action can be interpreted in a variety of ways, and previous research demonstrates that imagery perspective can determine whether actions are represented concretely or abstractly (Vallacher & Wagner, 1985). Abstract descriptions relate actions to a broader context, whereas concrete descriptions refer to actions in terms of their constituent steps. The distinction between concrete and abstract interpretations is important, as the subjective meaning of the action changes in accordance with how it is interpreted (Trope & Liberman, 2010). For instance, a concrete interpretation of Rachel's chemistry class would focus her on the class's constituent steps (e.g., the interesting and engaging material and practice problems), whereas an abstract interpretation would focus her on the class's broader context (e.g., studying a subject which Rachel believes is of more relevance to men than women).

Due to its sensory, experiential nature, first-person perspective processing often results in concrete interpretations of actions or events, while third-person perspective processing often results in abstract interpretations (Libby, & Eibach, 2015). Evidence for these varying interpretations is found in studies where photographs depicting common actions (e.g., wiping up a spill, stapling paper, cutting vegetables) were each given a concrete and an abstract description. For each action, there are two photographs: one depicting the action from first-person visual perspective, and the other from third-person visual perspective. The photographs are shot from the same distance to the action so they include the same objects at the same resolution (See Appendix B). Participants received either first-person or third-person perspective picture primes, and were then asked to describe the behaviors depicted in the photographs. Participants who viewed third-person images (vs. first-person) were more likely to use abstract descriptions to describe the behaviors (Libby, Shaeffer, & Eibach, 2009). Additionally, further experiments using the action photographs produced these effects by invoking distinct processing styles that carried over to following, unrelated tasks (Rees & Israel, 1935). That is, the effect of perspective in the action photographs carried over to influence the interpretation of subsequent actions unrelated to the pictured actions. The results from these studies suggest that first- and third-person visual perspective processing styles may be invoked by viewing a series of picture primes, and also that the processing style adopted will carry over to influence their interpretations of unrelated stimuli and events.

The Present Experiment

We hypothesize that because first-person imagery invokes a concrete, experiential processing style, it may be a useful tool for heightening people's sensitivity to their experience and reducing the impact of previously held biases, beliefs, and stereotypes when processing experiences of interest. To test this, participants were first randomly assigned to complete either an interesting or boring version of a task. Then, they were randomly assigned to view either first-person or third-person visual perspective pictures before explicitly rating their interest, engagement, and enjoyment in the task. We predicted that, by evoking an experiential processing style, first-person imagery (vs. third) would cause participants to be more sensitive to the actual experience of the task (i.e., whether or not it was interesting or boring). Thus, in the first-person perspective condition, we expected there to be a significant difference in ratings of interest, engagement, and enjoyment across the boring and interesting task condition. We also predicted that first-person imagery (vs. third) would attenuate, or even eliminate, biases in people's beliefs about whether or not they are the type of person who would typically be interested in tasks like the one they completed. Specifically, we predicted that on average, women (vs. men) would be more likely to believe they are the type of person who enjoys word puzzles and that these beliefs could bias their interpretations of how interesting the task was. Importantly, we predicted that while these gender differences in people's self-beliefs would bias their reports after viewing third-person imagery, which invokes a processing style that incorporates and relies on these beliefs, the processing style evoked by first-person imagery would attenuate or even eliminate the biasing impact of these beliefs.

Pilot Study One: Manipulating Experiences of Interest

Two versions of an anagram task were created to serve as the "interesting" and "boring" task that participants completed. Research on Flow, an optimal state of engagement, suggests that tasks designed to be challenging yet matched to one's ability are experienced as more interesting than tasks that are not challenging (Nakamura & Csikszentmihalyi, 2002). Based on this research, we created an easy anagram task in which participants received twelve low-difficulty anagram puzzles and another calibrated anagram task (i.e., participants who solved anagram puzzles correctly received subsequent anagrams that were more difficult) in which participants received twelve anagrams that better matched their ability (modeled after Zunick et. al Exp. 4, 2015). We predicted that the calibrated version would be experienced as more interesting, engaging, and enjoyable than the easy version.

Fifty participants from Amazon's MechanicalTurk piloted the anagram tasks. All participants received the following instructions prior to completing a practice anagram: "For this study, you will be completing a series of anagrams. On each page, you will see a string of letters that you will need to rearrange in order to form a word and a text box to type your answer."

Participants were also instructed to enter question marks "???" if unable to solve a question after several minutes. After reading the instructions, participants were randomly assigned to the boring condition, in which they completed twelve very easy anagrams, or the interesting condition, in which they completed twelve anagrams that calibrated to their ability. After completing the anagram task, participants answered "*How interesting did you find the questions in the puzzles to be?*", "*How engaging did you find the questions in the puzzles to be?*", and "*How enjoyable did you find the questions in the puzzles to be?*" on (1)*Very Uninteresting/Unengaging/Unenjoyable*, to (7) *Very Interesting/Engaging/Enjoyable* scales. These three questions ($\alpha = 0.90$) were averaged to create a composite "reported interest" score for each participant ($M = 5.55$, $SD = 1.21$). As predicted, the calibrated version was rated as significantly more interesting (M=5.88, $SD = 0.96$) than the easy version (M=5.18, $SD = 1.36$; $F(1,48) = 4.53$, p=0.04). See Figure 1.

Pilot Study Two: Measuring Gender Differences in Beliefs about Interest

We created a second survey to measure potential gender differences in participants' beliefs about their interest in word puzzles. Based on gender stereotypes that women are better at verbal tasks than men, we predicted that females (vs. males) would more strongly believe they are the type of person who would find word puzzles like the anagram task interesting.

Seventy participants from Amazon's MechanicalTurk (41 women, 29 men) read a brief description of the anagram task (identical to the task participants would complete in the actual study), but importantly, did not have the experience of actually completing an anagram task. After reading the task description, participants rated their agreement with the statement "*I am the type of person who likes tasks like this*" on a (1)"*Strongly disagree*" to (7) "*Strongly agree*" scale and answered three questions about how interesting, engaging, and enjoyable they find tasks like this on a (1) "*Very (uninteresting/unengaging/unenjoyable)*" to "*Very (interesting/engaging/enjoyable)*." Ratings from these questions ($\alpha = 0.96$) were averaged to create a composite score of self-beliefs for each participant ($M = 5.39$, $SD = 1.28$). Finally, participants reported their gender. As we anticipated, participants' self-beliefs conformed to gender stereotypes: women reported significantly higher interest on the composite index ($M = 5.68$, $SD = 1.25$) than men did (M= 4.97, $SD = 1.22$; $F(1,68) = 5.48$, p=.02). See Figure 2.

Experiment

Predictions

By differentially manipulating processing style, the perspective picture primes would influence the basis for participants' reports about a task the previously completed. Viewing first-person (versus third-person) photos would cause participants to be more sensitive to the differences in their experience created by the boring versus interesting version of the task. Whereas participants would rate the interesting task as more interesting than the boring task after

seeing first-person imagery, this task difference would be attenuated or even eliminated after seeing third-person imagery.

In contrast, viewing third-person (versus first-person) photos would cause participants' reports of interest to correspond more closely with gendered beliefs about interest. Whereas women would report experiences of greater interest than men after seeing third-person imagery, this gender difference would be attenuated or even eliminated after seeing first-person imagery.

Method

Participants

Two hundred forty-six individuals (165 female) participated in this study for $0.30 on Amazon's MechanicalTurk.

Procedure

The study was run using an online Qualtrics survey that participants accessed via MechanicalTurk. Participants first answered a series of questions ensuring that they had sufficient resources, time, and attention to complete the survey. Participants were randomly assigned to complete a set of anagrams that were very easy or a set of anagrams that calibrated to their performance. After completing the anagram task, participants were randomly assigned to view a series of twelve full-screen images depicting a set of hands completing every-day actions (e.g., ironing a shirt, wiping up a spill, or cutting a credit card in half) from either the first- or third-person visual perspective. After viewing the picture primes, participants were asked to explicitly rate how interesting, engaging, and enjoyable they found the anagram task to be. Finally, participants reported their gender and other basic demographic information before being debriefed and thanked for their participation.

Materials:

Anagram Task

Participants were randomly assigned to complete the easy or calibrated version of the anagram task outlined in pilot study one.

Picture Primes

After completing the anagram puzzles, participants were randomly assigned to view either first-person or third-person versions of 12 action images, presented at a rate of 3.5 sec per image (Libby, Shaeffer, & Eibach, 2009). Each image was presented full screen and depicted a common action, such as wiping up a spill, stamping a letter, or cutting vegetables. In the first-person condition, the images showed each action as it would appear from the first-person visual perspective. In the third-person condition, the images showed each action as it would appear from the third-person visual perspective. For each action, the objects in the image and the

distance to the action were held constant across the first-person and third-person versions so that only the visual perspective on the action varied across condition. See Appendix B.

Dependent Measure: Reported Interest

Directly after viewing the picture primes, participants answered questions about how interesting they found the anagram puzzles in the experiment to be. Specifically, participants answered "*How interesting did you find the questions in the puzzles to be?*", "*How engaging did you find the questions in the puzzles to be?*", and "*How enjoyable did you find the questions in the puzzles to be?*" on (1)*Very Uninteresting/Unengaging/Unenjoyable*, to (7) *Very Interesting/Engaging/Enjoyable* scales. These three questions ($\alpha = 0.92$) were averaged to create a composite reported interest score for each participant ($M = 5.16$, $SD = 1.47$). Participants also reported how difficult they found the anagrams to be, how well they feel they performed on the anagram task relative to other participants, and how many anagrams they believe they solved correctly during the task.

Demographic Questions

Finally, participants were asked some basic demographic questions, including a question that asked them to report their gender.

Results

We predicted that first-person imagery would invoke a processing style that would heighten participants' sensitivity to interest experienced during an anagram task. That is, we predicted that participants primed with first-person imagery (vs. third-person) would show a stronger difference in their ratings of interest across the calibrated ("interesting") and easy ("boring") task conditions. Additionally, we predicted that biases in participants' beliefs about whether or not they are the type of person to enjoy this kind of task (indexed by participant gender) would produce effects with third-person imagery, but be eliminated with first-person imagery. To test this, we submitted participants' composite interest score to a 2(first-person vs. third-person) x 2(boring vs. interesting task) x 2(male vs. female) ANOVA.

Perspective X Gender X Condition

We neither predicted nor found a significant three-way interaction between perspective, gender, and condition. Additionally, the two-way condition by gender interaction was not significant ($F(1, 238)=0.02$, $p=0.90$). However, the ANOVA did reveal our two predicted two-way interactions between perspective and task condition and perspective and gender.

Perspective X Condition

We found a significant interaction between perspective and condition ($F(1,238)=5.98$, $p=0.02$). As predicted, participants who viewed first-person images reported significantly higher composite interest ratings for the interesting condition ($M = 5.53$, $SD = 1.31$) than the boring

condition (M = 4.52, SD = 1.67; $F(1,238)=13.26$, $p < 0.001$). Participants who viewed the third-person images did not report significantly different composite interest ratings across interesting (M = 5.34, SD = 1.30) and boring conditions (M = 5.26, SD = 1.40; $F(1,238)=0.06$, $p=.81$). See Figure 3.

Perspective X Gender

We found a significant gender x perspective interaction ($F(1,238)=16.47$, $p<.01$). As predicted, in the third-person imagery condition, women composite interest ratings were significantly higher (M = 5.66, SD = 0.97) than men (M = 4.64, SD = 1.58; $F(1,238)=13.30$, $p < 0.001$). In the first-person imagery condition, ratings of interest were not significantly different between women (M = 4.98, SD = 1.59) and men (M = 5.07, SD = 1.59; $F(1,238)= 0.24$, $p= 0.62$). See Figure 4.

Discussion

The processing styles evoked by each visual perspective affected how people interpreted their experience completing the anagram task. First-person imagery caused participants to report interest in the anagram task that matched our manipulation of whether the task itself was interesting or not. That is, participants' composite ratings of interest in the first-person condition were significantly higher for the calibrated ("interesting") task than their ratings for the non-calibrated ("boring") task. In the third-person imagery condition, participants' composite ratings of interest were not significantly different across interesting or boring task condition. These results suggest that first-person imagery (vs. third) invokes a processing style that better attunes people to their phenomenological experiences.

In contrast, third-person imagery caused participants' reports of their interest in the anagram task to match stereotypical gendered *beliefs* about if they were the type of person who would enjoy this type of task. That is, third-person imagery caused females to rate the anagram tasks as significantly more interesting than males, mirroring pilot data showing that women (vs. men) are more likely on average to believe they are the type of person who would find this type of task enjoyable. In the first-person condition, there were no significant gender differences between male and female composite ratings of interest. These results provide support for the conceptual, belief-based nature of the processing style evoked by third-person imagery, and support the idea that processing style evoked by first-person imagery may be a useful tool for blocking people's reliance on their previously-held beliefs by heightening their sensitivity to their actual experience.

The pattern of findings from the present study conceptually replicates previous findings (Niese et al, in prep). In the previous experiment, participants completed a logical reasoning activity and then used the first- or third-person perspective a few days later to recall it and report their interest. First-person (vs. third-person) perspective caused people's reports of interest to correspond to measures of their phenomenological experience of completing the task. Third-

person (vs. first-person) perspective caused people's reports of interest to correspond with their previously-held beliefs when recalling the activity.

The present experiment extends this research to a new domain (anagrams vs. logical reasoning puzzles) and provides additional, convergent evidence for our interpretation of the previous results. First, by experimentally manipulating whether participants completed a task that either evokes an experience of interest or not, we are better able to establish the causal role people's experiences of interest play in first-person imagery. Second, using picture primes provides a cleaner manipulation of our processing style explanation by producing carry-over effects and ruling out potential confounds in episodic memories from the two visual perspectives. For example, other variations in the images that participants hold in their minds (e.g. distance, number of objects in the scene) while recalling events may have significant implications for how the events are ultimately processed. To illustrate, if using the first-person perspective reduces the number of objects in the pictured scene, this could potentially attune people to their experience of interest simply because people are less likely to focus on and be distracted by other objects in the image. Lastly, our results suggest that the processing styles evoked by first- and third-person imagery can bias participants' recall of an experience that occurred only seconds prior, whereas previous research examined imagery perspective's influence on interpretations of events that occurred at least one day prior to recall (Niese et al., in prep). This finding suggests that the effects of visual imagery perspective are not limited to cases where time has decreased the accuracy or clarity of an individual's memory. In the present study, participants received the visual imagery photo primes seconds after completing the anagram task, yet were still successfully manipulated to focus on either the experiential or conceptual facets of the task when evaluating their experiences. The true experience of completing the anagram task (i.e., whether it was interesting or not) should have been readily available to interpret, however, participants who viewed third-person imagery relied on their gendered beliefs to evaluate their experience.

Implications for Academic Interventions

A next step in this line of research is to examine visual imagery perspective's potential to supplement and enhance the efficacy of teaching methods designed to heighten students' motivation to learn. One strategy found to combat a lack of motivation amongst students is to increase the "interestingness" of the material (Hidi, 1990; Schank, 1979). A popular method used to increase interest in classroom material is called "Catch and Hold" (Linnenbrink & Pintrich, 2002; Hidi & Harackiewicz, 2000; Mitchell, 1993). The Catch and Hold method is implemented by first piquing students' in-the-moment interest (i.e., "catching" students' attention), then facilitating a lasting interest in the material by presenting the information as personally useful or meaningful (i.e., "holding" students' attention). The success of the "hold" factors has been shown to be the better predictor of continuing interest (vs. the "catch" factors) (Harackiewicz, Barron, Tauer, Carter, & Elliot, 2000), which ultimately increases students' academic motivation overtime.

If the "hold" portion of Catch and Hold relies on students interpreting their experiences as meaningful and interesting *over time* as opposed to only in-the-moment, then perhaps pairing first-person imagery with the "hold" portions would better attune students to their experiences of interest. We predict that using first-person perspective imagery to invoke an experiential processing style on the "hold" experiences would heighten sensitivity to the experience of learning the meaningfulness and value of the information taught, as well as reduce the impact of any beliefs the students held about the subject material prior to participating in Catch and Hold. Additionally, whereas in the current study participants viewed imagery post-anagram task, manipulating perspective prior to a task could potentially serve to invoke an experiential (using first-person imagery) or conceptual (using third-person imagery) mindset prior to completing a task. This may be an important step as people's pre-existing self-views can also bias and shape their online experience with a task (Critcher & Dunning, 2009). Using first-person imagery to invoke first-person processing style prior to or post students' experiences of interest would hopefully increase the overall efficacy of Catch and Hold, and thus result in an increased amount of consistently motivated students.

Implications for the Gender-Gap in STEM

These findings have potentially significant implications for how personal interest development is approached, particularly for underrepresented groups in a domain. For instance, women currently make up 15% of the engineering workforce and 25% of the mathematical science workforce (National Science Board, 2016). Further, it is likely that commonly held stereotypes and biases about women are contributing to this gap, as previous research found that undergraduate engineering students believe that women in STEM careers face more problems overall than men—specifically, family-career conflict, confidence, discriminatory attitudes, and competitiveness (Hartman & Hartman, 2008). The present study (and others, e.g. Ehrlinger & Dunning, 2003) suggests that these differences in previously-held beliefs can influence people's interpretations of their experiences, which may in turn impact career choices. If this is the case, then first-person visual imagery may be a helpful tool to combat this effect and thus lessen the gender gap in the STEM workforce.

Rachel, the student who holds beliefs that STEM subjects are more suitable for men than women, is likely to be deterred from pursuing a career in a STEM field, even if she would find the subject engaging. We would predict that using first-person imagery perspective to process her experiences with STEM subjects would reduce the impact of her biasing beliefs (e.g., that STEM jobs are better suited for men than women) on interpretations of her experiences. More specifically, we would predict that using first-person perspective processing style on her experiences relating to STEM would attune Rachel to the true experience and content of the work, as opposed to her beliefs about gender and perhaps relieve her hesitance to pursue a career in a STEM field.

Implications for Negative Experiences

Although most of the current discussion has focused on ways first-person imagery may help people overcome their biasing beliefs to attune them to their experience, it is worth noting that there may be instances in which this would be detrimental. For example, imagine a young student, Becca, who has historically loved chemistry, but recently took a class with a professor who held discriminatory attitudes towards women in STEM, causing Becca to have a negative experience. Critically however, her negative experience was not caused by a lack of interest in chemistry, but instead was influenced by a non-central feature of the situation (e.g. threatened feelings of belongingness due to a single professor). As such, attuning Becca to this belongingness threat may actually compound the problem and cause her to lose interest in the subject (e.g. Good, Rattan, & Dweck, 2012).

In cases like this, third-person perspective processing style may be the more useful tool by allowing individuals to benefit from the relative stability of their broader conceptual self-beliefs. For instance, in order to attune Becca to her beliefs about her interest in chemistry, and to reduce the effect of her actual class experience, perhaps Becca would benefit from processing her experiences in chemistry class conceptually by using third-person perspective processing style. We would predict that using third-person visual perspective processing would increase Becca's reliance on her beliefs about chemistry, and how chemistry fits into her life conceptually (e.g., "I have always loved chemistry", "I'm going to be a chemist"), while lessening the impact of this isolated negative experience in the classroom.

Conclusion

The discovery and development of our personal interests is an important yet fragile process, susceptible to a host of biases, stereotypes, and random occurrences. Developing personal interests depends on how individuals process and interpret their experiences (Silvia, 2001). In the current study, we examined two different processing styles (first- and third-person visual imagery perspective) on a task designed to be experienced as interesting (or not). We found that viewing first-person imagery invoked a processing style that resulted in a heightened sensitivity to task experience and reduced the impact of previously held beliefs, whereas viewing third-person imagery invoked a processing style that resulted in low sensitivity to task experience, and a significant reliance on previously-held beliefs. The results of this study support that first-person imagery invokes an experiential processing style that blocks the impact of previously-held beliefs, whereas third-person imagery invokes a conceptual, belief-based processing style that is less attuned to concrete experience. Our results suggest that visual imagery perspective may be a useful tool to help people develop personal interests that align with their actual experience.

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Appendix A: Graphs

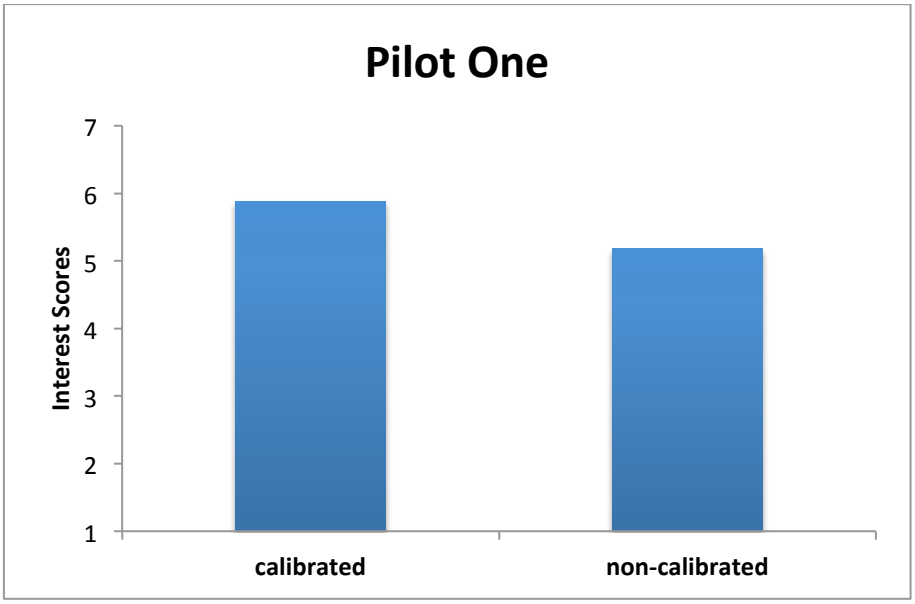


Figure 1. Composite ratings of interest in calibrated and non-calibrated anagram task. Participants rated their interest, engagement, and enjoyment on a 1-7 scale.

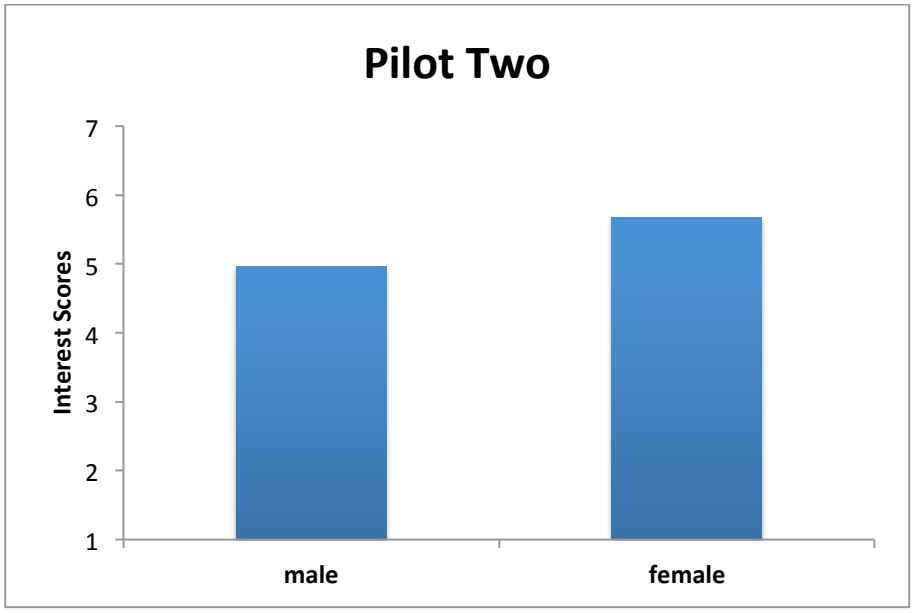


Figure 2. Composite ratings of perceived interest in completing an anagram task. Participants rated their interest, engagement, and enjoyment on a 1-7 scale.

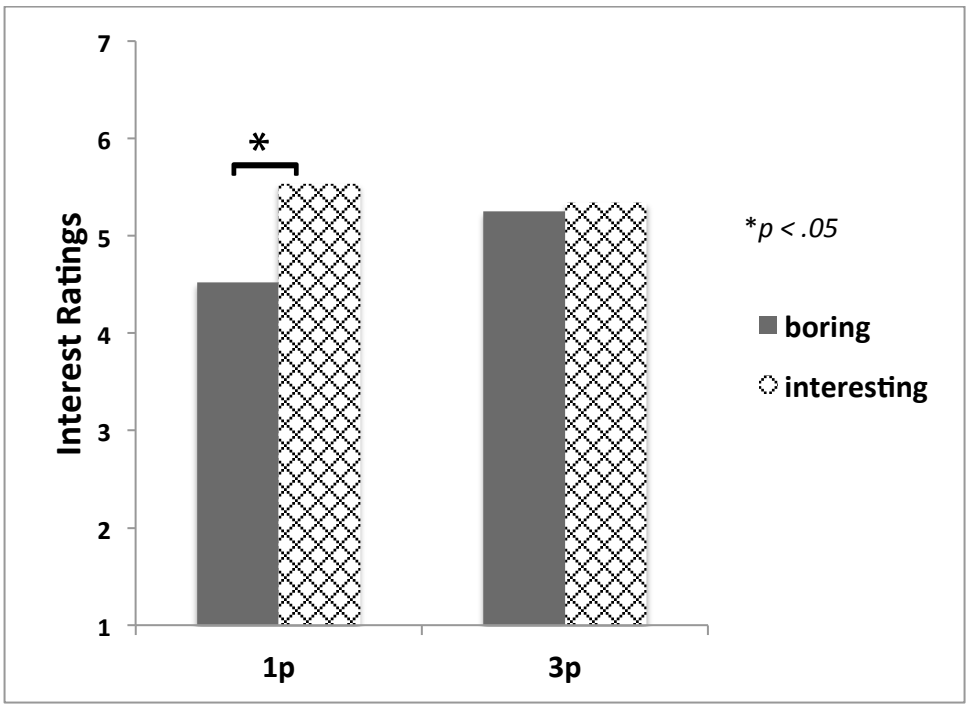


Figure 3. Composite interest ratings in completing either a boring or interesting anagram task across first- and third-person conditions. Participants rated their interest on a 1-7 scale.

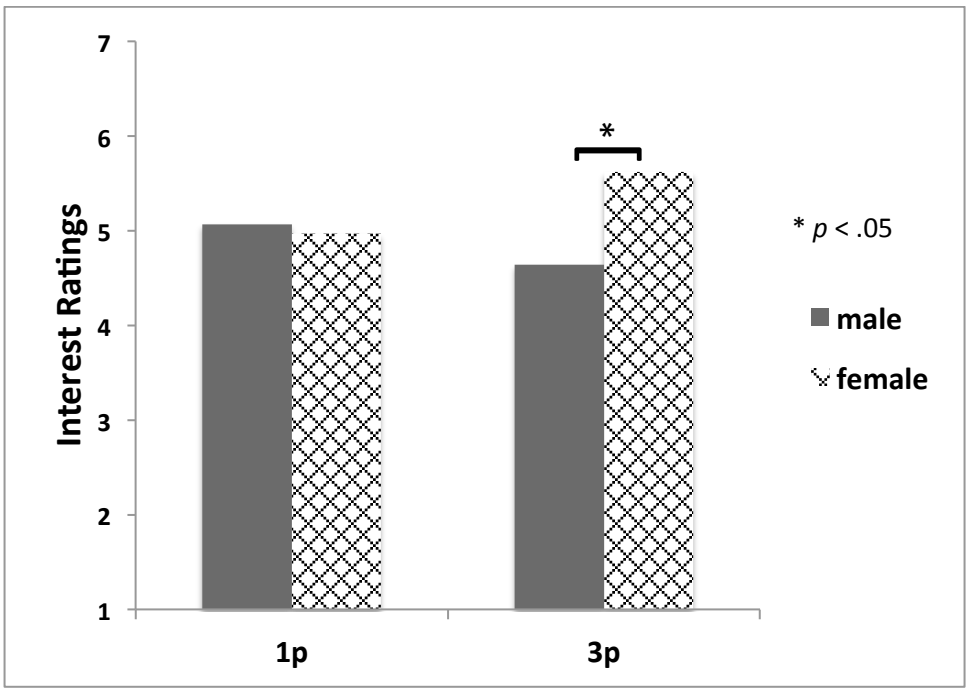
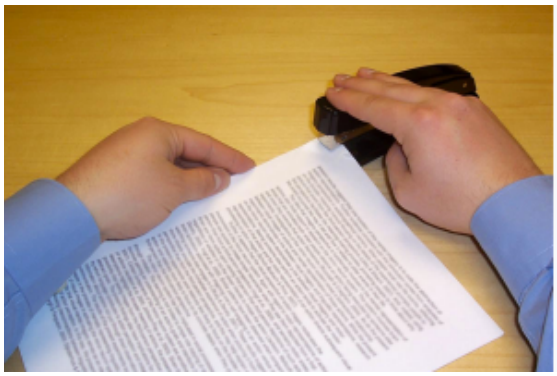
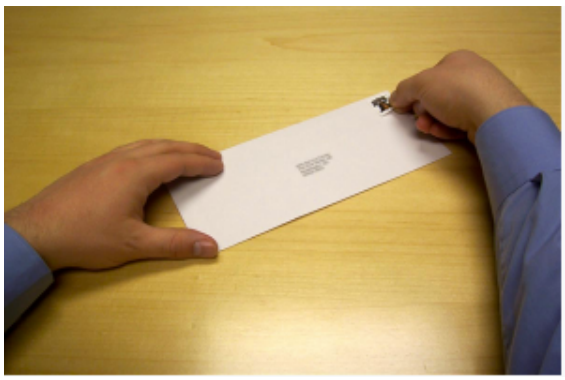


Figure 4. Composite interest ratings from males and females for anagram tasks across first- and third-person conditions. Participants rated their interest on a 1-7 scale.

Appendix B: Picture Primes

1) Examples of four first-person imagery picture primes. In the actual experiment, participants viewed a series of 12 picture primes all from either first- or third-person perspective.





2) Example of four third-person perspective imagery picture primes.